

# United States Patent [19]

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[54] **METHOD OF REDUCING THROUGHPUT OF SPINNING PUMPS**

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### Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 537,480, Sep. 30, 1983, abandoned.

[51] Int. Cl.<sup>4</sup> ..... **B29C 31/04; B29C 47/92; G06F 3/14**

[52] U.S. Cl. .... **364/470; 264/40.7; 425/145**

[58] Field of Search ..... **264/40.1, 40.7, 210.8; 425/145; 364/473, 470, 469**

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### [57] ABSTRACT

A method of providing automatic positional control spinning pump throughput on a multiposition spinning machine during periods of yarn interruption by sensing yarn breaks and reducing spinning pump speed by a predetermined amount.

**1 Claim, 5 Drawing Figures**

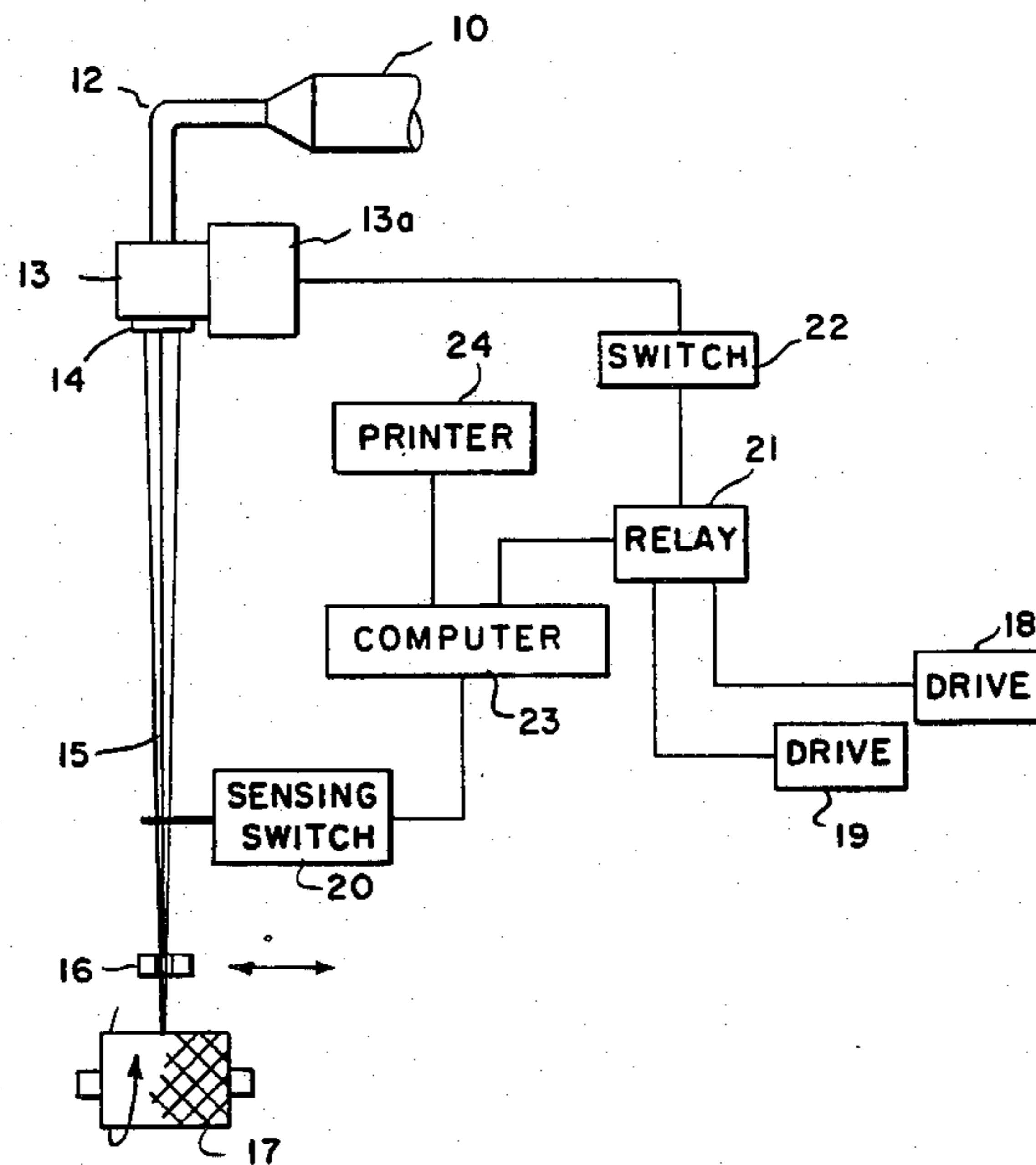


FIG. 1

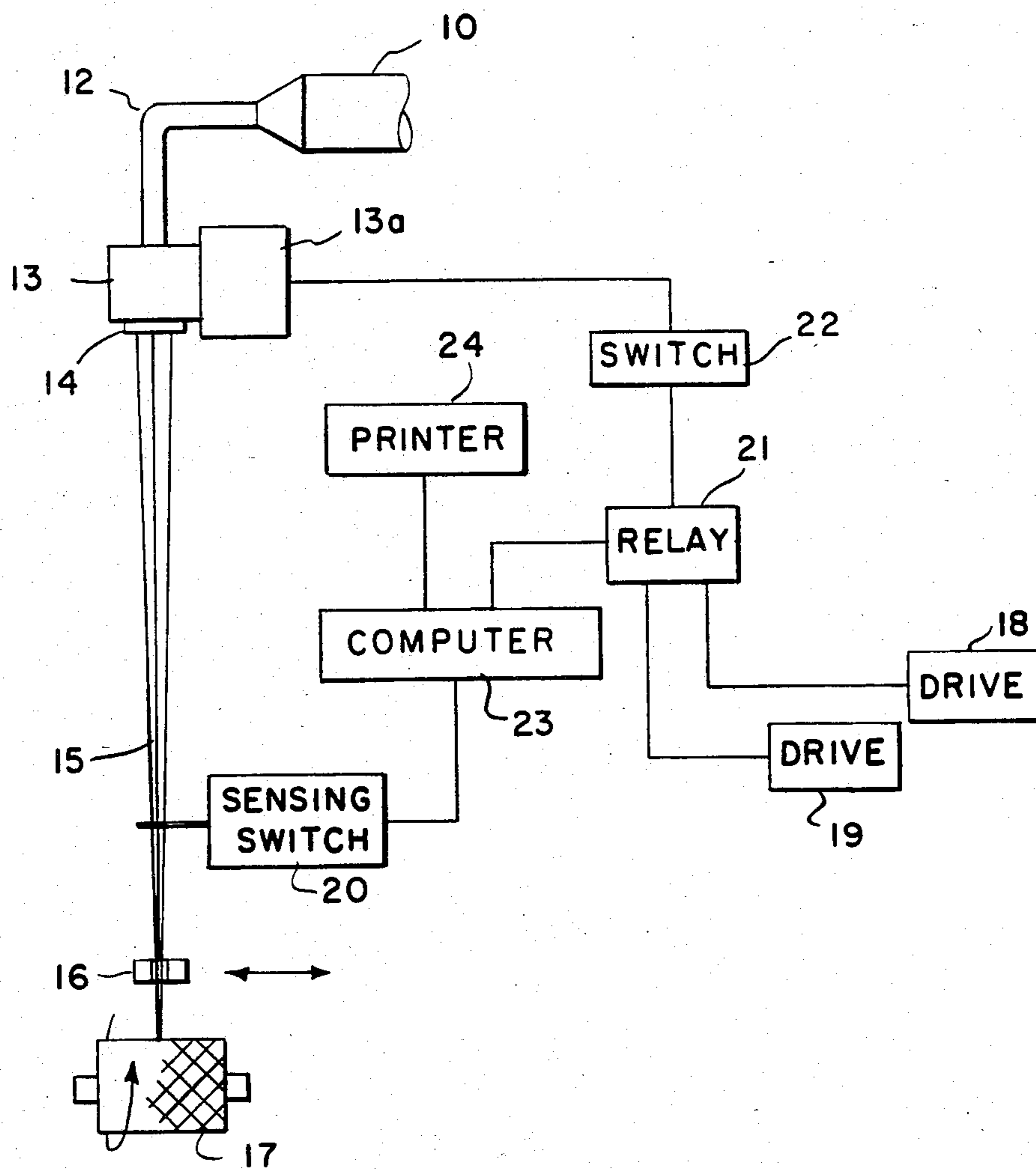


FIG. 2

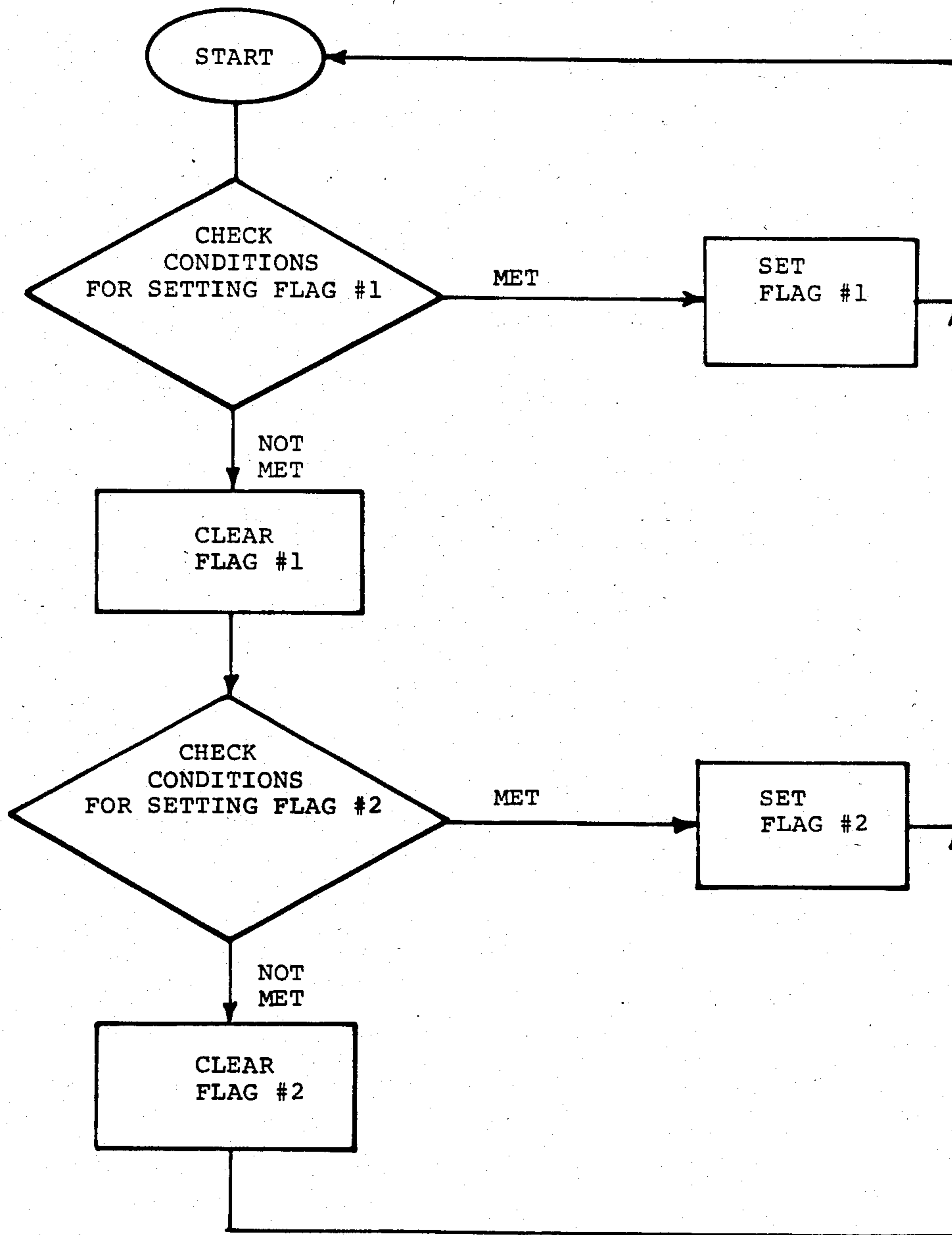
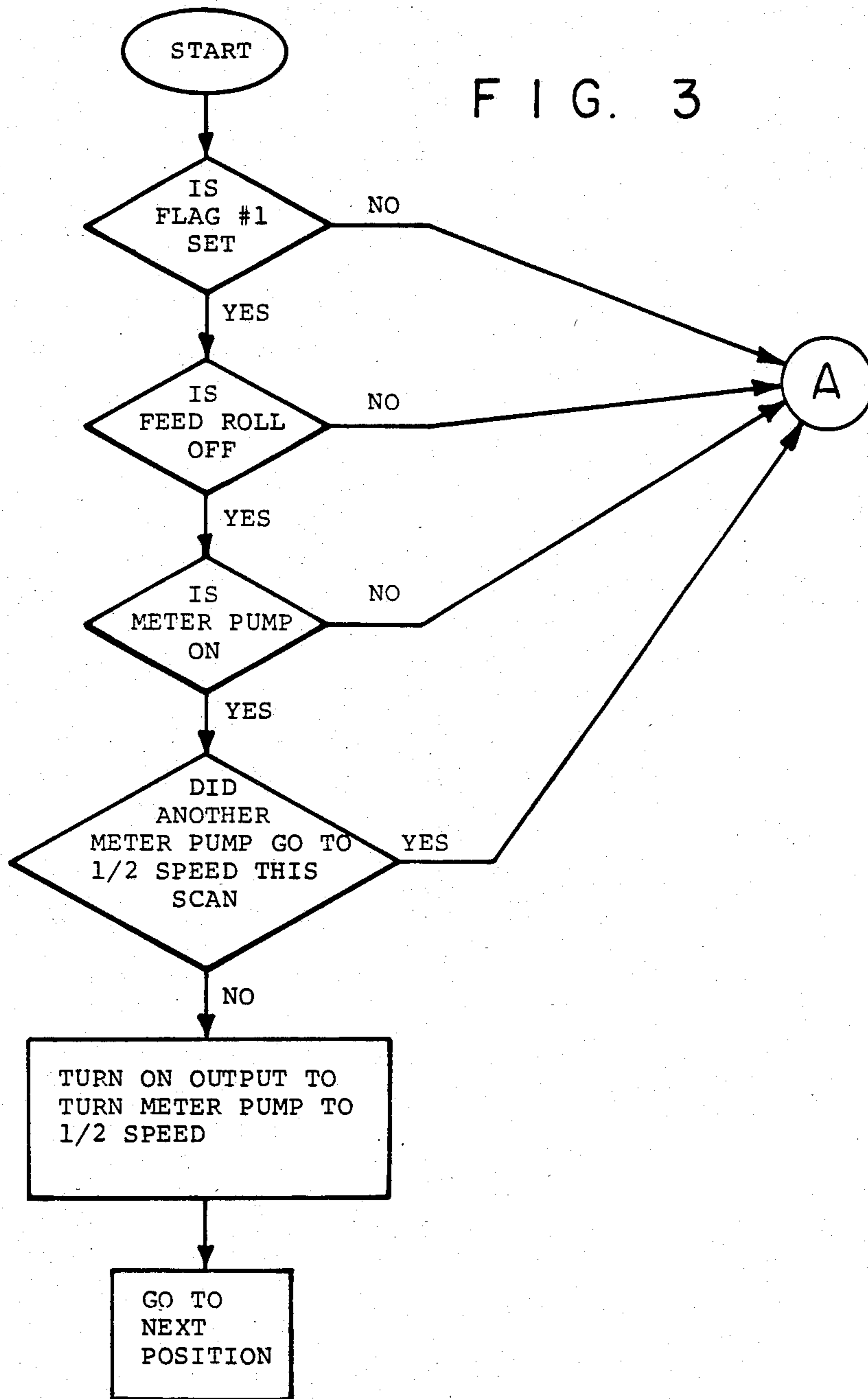
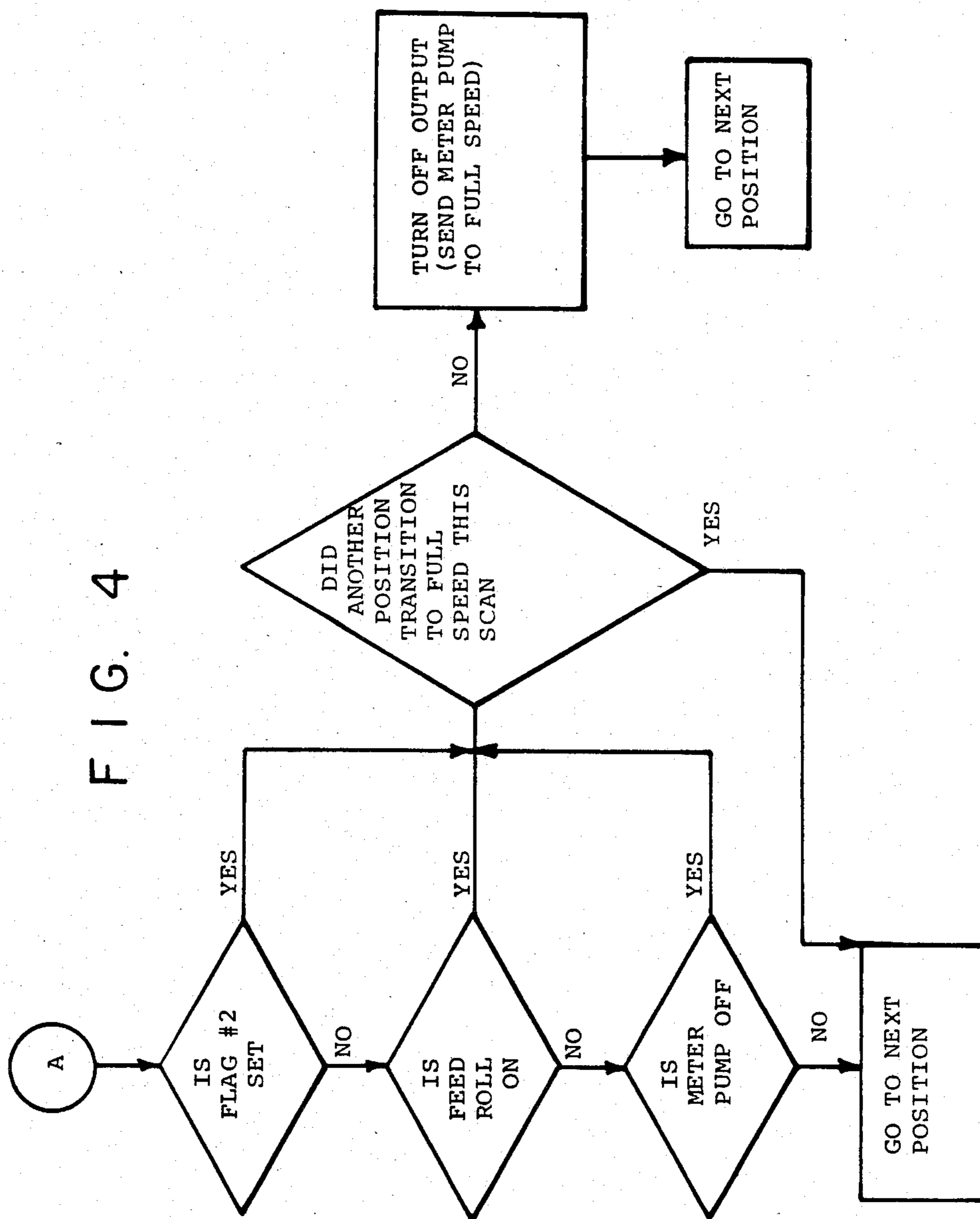
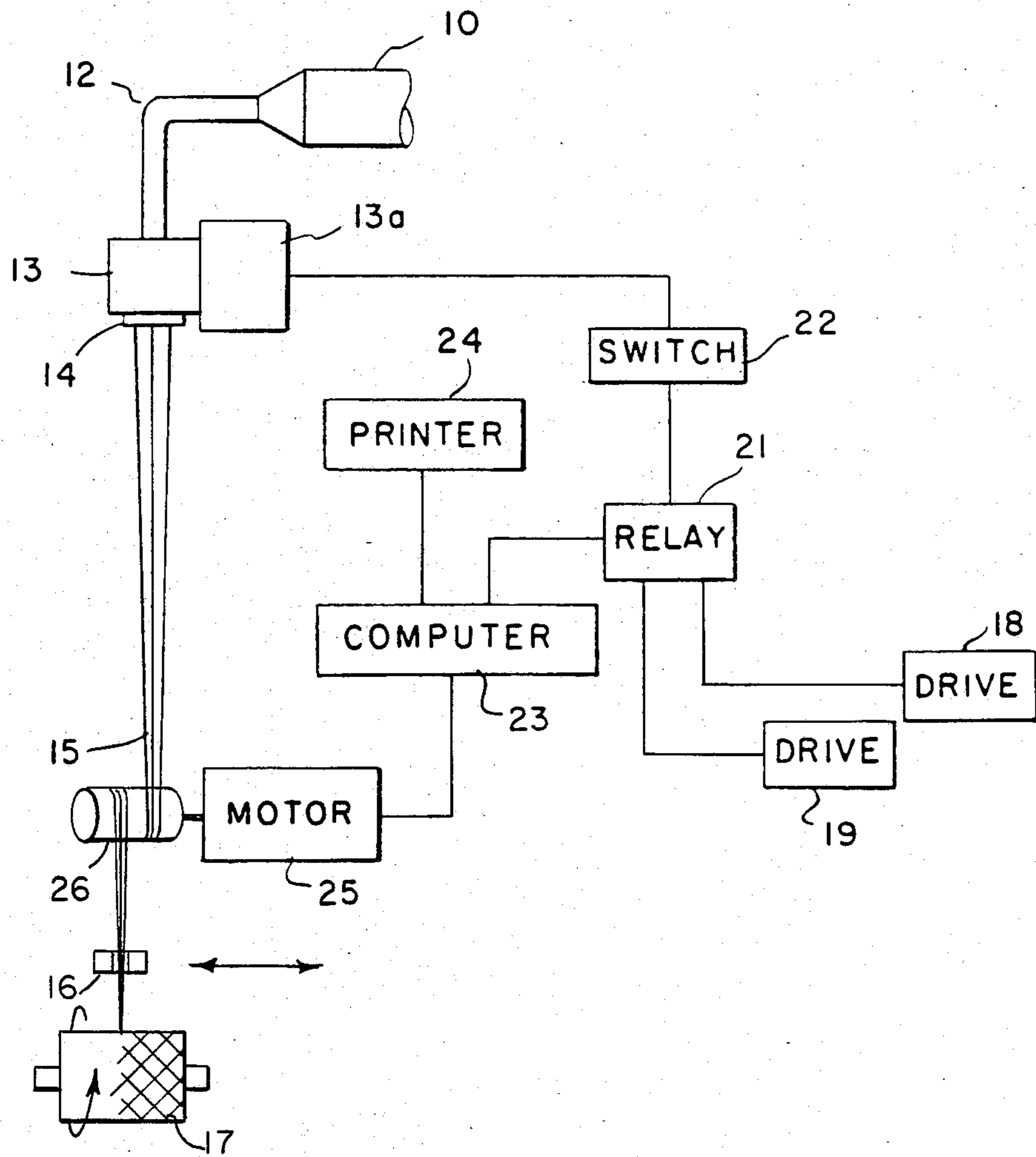


FIG. 3





F I G. 5





## METHOD OF REDUCING THROUGHPUT OF SPINNING PUMPS

This application is a continuation-in-part of our co-  
pending application Ser. No. 537,480 and now aban-  
doned.

### BACKGROUND OF THE INVENTION

The invention relates to processes for producing fi-  
bers from synthetic polymer, and more particularly, it  
relates to monitoring these processes to provide posi-  
tional control of polymer throughput.

In the past, it has been a common practice to provide  
power, to polymer or solution spin pumps on spinning  
machine positions, at a drive frequency and voltage  
required to produce the desired throughput and fiber  
denier. Many pumps have been driven by a single drive  
for product consistency, uniformity, and simplicity.  
During time periods when fiber production has been  
interrupted, as a result of process breaks or positional  
maintenance, spin pumps have continued to operate at  
full throughput causing a loss of ingredients and pro-  
duction of excessive waste. Alternatively, spin pumps  
can be shut down completely for breaks or maintenance  
but experience has shown that shutting down positional  
spin pumps for substantial periods of time can lead to  
excessive costs related to loss of spin pack, freezing of  
polymer in transferlines, and general degradation and  
loss of control of polymer quality. Furthermore, when a  
pump which has been shut down is restarted, the poly-  
mer temperature and quality is off standard for a time  
related to the length of the shutdown. In addition, when  
a number of spinning positions of a multiposition ma-  
chine are shut down simultaneously, the flow of poly-  
mer through the common manifold supplying the posi-  
tions which are still operating is slowed to a point at  
which the chemical and/or physical properties of the  
product from the operating positions may be affected,  
or the polymer supply system can be adversely affected  
in other ways.

### SUMMARY OF THE INVENTION

This invention provides an automatic positional con-  
trol of spin pump throughput of a multiposition fiber  
producing machine during break periods or when main-  
tenance is required by sensing discontinuities and reduc-  
ing the spin pump speed to a predetermined level, pref-  
erably about 40-60% of normal operating level, if few  
other positions of the machine are similarly reduced. A  
computer determines whether a predetermined permis-  
sible number of positions is operating at reduced  
throughput, and if so, the position having the most  
recent break is maintained at normal throughput until  
one or more of the positions operating at reduced  
throughput resumes normal operation. At such time,  
the position having the break may be reduced to the  
predetermined throughput.

The process is monitored by appropriate sensing de-  
vices and if a discontinuity is indicated (loss of power,  
yarn break, speed deviation, etc.) a signal is transmitted  
to a pre-programmed microprocessor or computer  
which senses signals indicating discontinuities and se-  
lectively enables drive switching elements to transfer  
spin pump motor power from a production speed con-  
trolling drive to a second drive with reduced frequency  
and voltage output. Information stored in the micro-  
processor memory related to other positions operating

at reduced throughput determines whether or not an  
enabling signal will be transmitted to drive switching  
elements permitting positional throughput reduction at  
any given time.

### BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic drawing of the system of this  
invention coupled to a single position of a melt spinning  
machine.

FIGS. 2-4 are computer logic flow diagrams.

FIG. 5 is a schematic drawing of another preferred  
embodiment of the system of this invention.

### DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

In one method chosen for purposes of illustration  
(FIG. 1) a molten polymer is supplied from manifold 10,  
through a transfer line 12, spinning pump 13 and spin-  
neret 14 to produce threadline 15 comprised of multiple  
filaments of yarn extruded from spinneret 14. The  
threadline 15 advances through a traversing guide 16 to  
an individual windup where it is wound as a package 17.  
Electric motor 13a drives spinning pump 13 at a speed  
regulated by drives 18 or 19 which in turn are con-  
nected to the motor 13a through relay 21, and switch  
22. A yarn sensing switch 20 is positioned in threadline  
15 to detect the absence or presence of the threadline  
and is connected to computer 23. The computer 23 is  
interfaced with the yarn sensing device, the relay 21 and  
display module or printer 24.

The control components of the apparatus are com-  
mercially available items. Typical components are as  
follows:

ELEMENT CODE	ELEMENT NAME	COMMERCIAL IDENTIFICATION
18	Production Drive	Borg-Warner Type C-40
19	Reduced Frequency Drive	PTI Model 6300 Drive
20	Sensing Switch	Micro Type BZ-2RW84-8223
21	Relay	Square D, Class AO-1-D 4373-511-207503-LS
22	Manual Cutdown Switch	Square D, Class 9001, Type T-A
23	Microprocessor/ Controller	Gould-Modicon Model 484
24	Printer	Digital Dec Writer No. III

In operation, when threadline 15 breaks or is other-  
wise missing yarn sensing switch 20 sends a signal to the  
controller 23 which determines, as more fully described  
below, whether or not an enabling signal will be trans-  
mitted to relay 21. Relay 21, if activated, connects drive  
19 to motor 13a. Drive 19 which operates a reduced  
frequency causes the speed of motor 13a to be reduced  
and as a consequence throughput is reduced. During  
maintenance periods, motor 13a can be deenergized  
manually by activation of switch 22.

The computer interfaces with sensing device 20 and  
relay 21 and information stored in the computer relating  
to other positions of the spinning machine operating at  
reduced throughput determines whether or not an en-  
abling signal will be transmitted to relay 21 permitting  
motor 13a to be connected to the reduced speed drive  
19. Upon command the computer 23 transmits data to  
printer 24 for display. A description of the logic control  
flow charts to accomplish this is as follows:



The logic for automatic control of spinning machine throughput can be broken into two categories, general logic (FIG. 2) (which looks at the combined status of all (28) positions), and specific logic (FIGS. 3 and 4) (which looks at only one of the 28 virtually identical sets of specific logic; one set for each position. The general logic looks at the overall situation (e.g., how many pumps are off), and as a result of this information and the status of the mode selection switch, sets or clears two flags which operate in the following manner:

When flag No. 1 is on, this says to the position logic that if conditions (at the position) indicate, then the position can go to 1/2 speed. When off, this flag says no further positions can go to half speed.

When flag No. 2 is on, this says that if any positions are at 1/2 speed, then one of those positions must return to full speed. When off, this flag simply says no further positions have to go to full speed.

Flags 1 and 2 may both be off but only one can be on. They are, by definition, mutually exclusive.

In another preferred embodiment the loss of power to a motor driving a feed roll in the threadline triggers the throughput reduction. As shown in FIG. 5, feed roll motor 25 is coupled to feed roll 26 which when driven in the direction indicated by the arrow forwards filaments 15 to traverse mechanism 16. The computer 23 is now interfaced with the motor 25. In operation, when the motor 25 is deenergized a control signal is initiated and transmitted to computer 23 which then operates in the manner described above in connection with the logic diagrams of FIGS. 2-4. In this case, the restarting of motor 25 automatically brings motor 13a back to full energization and as a consequence pump 13 back to full throughput.

In a series of tests it has been determined, for example, that four of a total of twenty-eight positions can be operated at 50% throughput without negative effects.

In other situations, the number of positions on reduced throughput and the degree of reduction may differ depending on the quality requirements of the particular products, the characteristics of the spinning equipment and the costs involved.

The process of the invention not only reduces waste but maintains the positions on reduced throughput in condition to make standard product as soon as they are returned to normal operation.

While two preferred methods have been described, it should be understood that interruptions of other machine functions or other indications of loss of threadline could be used to trigger the reduction of throughput described in this system.

We claim:

1. A method for reducing throughput of one or more spinning pumps in a multiposition spinning machine having a spinning pump at each position in response to yarn interruption signals from a spinning position wherein said spinning pumps are driven by individual electric motors energized from a common source supplying a set frequency and voltage, said method comprising: transmitting said signals to a microprocessor; scanning said multiposition spinning machine to determine the number of yarn interruption signals occurring at any given time; comparing the number of yarn interruptions to a predetermined number; and reducing the frequency and voltage supplied to the electric motor driving the spinning pump supplying the position signalling a yarn interruption by connecting said motor to an alternate source supplying a frequency and voltage lower than the common source supplying said set voltage and said set frequency to reduce the speed of the spinning pump when the yarn interruption signals do not exceed said predetermined number.

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